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10/798,312	03/12/2004	John M. Shaw	12265-23/PMdC	5772
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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

## Office Action Summary

### Application No.

10/798,312

### Applicant(s)

SHAW, JOHN M.

### Examiner

Edna Wong

### Art Unit

1795

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 23 November 2007.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-26 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-26 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- ☒ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☒ Information Disclosure Statement(s) (PTO/SB/08)  
Paper No(s)/Mail Date September 2, 2004.
- ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- ☐ Notice of Informal Patent Application
- ☐ Other: \_\_\_\_\_.

***Specification***

The disclosure is objected to because of the following informalities:

page 1, line 4, the words "now allowed" should be amended to the words -- now  
US Patent No. 6,736,955 --.

page 11, line 14, the word -- be -- should be inserted after the word "may".

page 14, line 22, reference character "32" has been used to designate both a  
hydrogen stream and water (from page 14, line 5). It is unclear what reference character  
"32" designates.

Appropriate correction is required.

The lengthy specification has not been checked to the extent necessary to  
determine the presence of all possible minor errors. Applicant's cooperation is  
requested in correcting any errors of which applicant may become aware in the  
specification.

***Claim Rejections - 35 USC § 112***

Claims **24-26** are rejected under 35 U.S.C. 112, second paragraph, as being  
indefinite for failing to particularly point out and distinctly claim the subject matter which

applicant regards as the invention.

Claim 24

lines 1-2, "the carbon dioxide feed stream" lacks antecedent basis.

Claim 25

lines 1-2, "the carbon dioxide feed stream" lacks antecedent basis.

Claim 26

line 1, "the biogas" lacks antecedent basis.

***Double Patenting***

The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with

37 CFR 3.73(b).

Claims **1-26** are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-25 of U.S. Patent No. 6,736,955 B2 (Shaw). Although the conflicting claims are not identical, they are not patentably distinct from each other because the invention claimed in claims 1-26 of the present application fail to be patentably distinct from the inventions claimed in claims 1-25 of the patent because the subject matter claimed in the present application is fully disclosed in the patent and would be covered by the patent since the present application and the patent are claiming common subject matter, as follows:

Claims 1, 2 and 11 of the Present Application

1. A process for the production of methanol comprising: **(a) feeding** an amount of a hydrocarbon feedstock and an amount of an oxygen feedstock to a partial oxidation reactor to produce a partial oxidation reactor effluent comprising hydrogen, carbon monoxide and carbon dioxide; **(b) adding** an amount of a hydrogen feedstock to the partial oxidation reactor effluent to produce a synthesis gas stream having a predetermined ratio of hydrogen to carbon monoxide; and, **(c) subjecting** the synthesis gas stream to methanol synthesis to produce a methanol product stream and a tail gas stream **wherein reformation is not used to provide hydrogen as a product**.

2. The process as claimed in claim 1 further comprising **electrolyzing water** to produce hydrogen and oxygen and recovering at least some of the hydrogen to produce at least a portion of the hydrogen feedstock.

11. The process as claimed in claim 1 further comprising the step of withdrawing **a purge stream from the tail gas stream and recycling essentially the remainder of the tail gas stream** to the partial oxidation reactor.

Claims 1 and 19 of the Patent

1. A process for the production of methanol comprising: **(a) feeding** an amount of a hydrocarbon feedstock and an amount of an oxygen feedstock to a partial oxidation reactor at a first pressure to produce a partial oxidation reactor effluent comprising hydrogen, carbon monoxide and carbon dioxide; **(b) electrolyzing water** to produce hydrogen and oxygen and recovering at least a portion of the hydrogen to produce a hydrogen stream; **(c) adding** an amount of a hydrogen feedstock, at least a portion of which is obtained from the hydrogen stream, to the partial oxidation reactor effluent to produce a synthesis gas stream having a predetermined ratio of hydrogen to carbon monoxide; **(d) subjecting** the synthesis gas to methanol synthesis at a pressure higher than the first pressure to produce a methanol

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product stream and a tail gas stream; **(e) separating the tail gas stream** into at least two streams comprising a purge stream and a recycle stream, the recycle stream comprising a substantial portion of the tail gas stream; and, **(f) recycling the recycle stream** to the partial oxidation reactor.

19. A process for the production of methanol comprising: (a) electrolyzing water to produce hydrogen and oxygen and recovering at least some of the hydrogen to produce a hydrogen stream and recovering at least some of the oxygen to produce an oxygen stream; (b) feeding an amount of a hydrocarbon feedstock and an amount of an oxygen feedstock, at least a portion of which is obtained from the oxygen stream, to a partial oxidation reactor at a first pressure to produce an effluent gas stream comprising hydrogen, carbon monoxide and carbon dioxide; (c) adding an amount of a hydrogen feedstock, at least a portion of which is obtained from the hydrogen stream, to the partial oxidation reactor effluent to produce a synthesis gas having a predetermined ratio of hydrogen to carbon monoxide; (d) subjecting the synthesis gas to methanol synthesis at a pressure higher than the first pressure to produce a methanol product stream and a tail gas stream; (e) recycling a portion of the tail gas stream to the partial oxidation reactor; and, (f) obtaining a purge gas stream from the tail gas stream and combusting the purge stream to obtain energy **wherein reformation is not used to provide hydrogen as a product.**

The claims of the present application fail to be patentably distinct from the claims of the patent because the independent claims of the present application recites similar limitations, either alone or in combination with their dependent claims, as that of the claims of the patent wherein the claims of the present application encompasses the claims of the patent. Therefore, the claims would have been obvious variants over each other.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

I. Claims 1, 8-14, 17, 20 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over **van Dijk** (US Patent No. 5,472,986) in combination with **CA**

**2,210,391 ('391).**

van Dijk teaches a process for the production of methanol (col. 1, lines 9-12) comprising:

(a) feeding an amount of a hydrocarbon feedstock **30** (= natural gas) and an amount of an oxygen feedstock **26** (= an oxygen-rich permeate gas stream) to a partial oxidation reactor **32** (= an adiabatic reformer reactor) to produce a partial oxidation reactor effluent comprising hydrogen, carbon monoxide and carbon dioxide (= to produce a synthesis gas containing CO, CO<sub>2</sub>, H<sub>2</sub> and other components);

(b) adding an amount of a hydrogen feedstock **60** (= a hydrogen-rich recycle gas stream) to the partial oxidation reactor effluent to produce a synthesis gas stream **34** (= synthesis gas) having a predetermined ratio of hydrogen to carbon monoxide (= the hydrogen-rich gas stream **60** is supplied in an amount that upon its combination with the synthesis gas **34** forms a combined synthesis-hydrogen recycle gas stream **36** wherein the ratio of (H<sub>2</sub>)/(2CO + CO<sub>2</sub>) is at least about 0.95); and,

(c) subjecting the synthesis gas stream **36** to methanol synthesis **38x** to produce a methanol product stream **46x** and a tail gas stream **50** (= the combined synthesis-hydrogen recycle gas stream is then fed to the first of a plurality (x) of methanol conversion reactors **38x** wherein the gas contacts a methanol conversion catalyst to react a portion of the H<sub>2</sub>, CO and CO<sub>2</sub> content of the gas to methanol) [col. 8, line 12 to col. 9, line 4; and Fig. 1).

The hydrocarbon feedstock includes carbon dioxide (= from the natural gas) [col. 8, lines 29-30].

The synthesis gas which is subjected to methanol synthesis has a ratio of hydrogen minus carbon dioxide mole fraction to carbon dioxide plus carbon monoxide mole fraction of from about 1:1 to about 3:1 ( $= (H_2)/(2CO + 3CO_2)$ ) is at least about 0.95 [col. 8, lines 40-41].

The synthesis gas, which is subjected to methanol synthesis, has a ratio of hydrogen minus carbon dioxide mole fraction to carbon dioxide plus carbon monoxide mole fraction which is about 2:1 ( $= (H_2)/(2CO + 3CO_2)$ ) is at least about 0.95 [col. 8, lines 40-41].

The process of van Dijk differs from the instant invention because van Dijk does not disclose the following:

a. Wherein reformation is not used to provide hydrogen as a product, as recited in claim 1.

van Dijk teaches adiabatic reforming (col. 8, lines 30-34).

Like van Dijk, CA '391 teaches a process for the production of methanol.

CA '391 teaches that the conversion of a hydrocarbon-containing feedstock into synthesis gas can be effected by any appropriate technique, for example by steam reforming, by partial oxidation, by secondary/autothermal reforming, or by a combination of two or more of these processes (page 1, lines 7-9; and page 1, line 24 to page 2, line



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1).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the process described by van Dijk with wherein reformation is not used to provide hydrogen as a product because the conversion of a hydrocarbon-containing feedstock into synthesis gas would have been effected by any appropriate technique, for example by steam reforming, by partial oxidation, by secondary/autothermal reforming, or by a combination of two or more of these processes as taught by CA '391 (page 1, lines 7-9).

b. Wherein the process further comprises the step of recycling a portion of the tail gas stream to the partial oxidation reactor, as recited in claim 10.

c. Wherein the process further comprises the step of withdrawing a purge stream from the tail gas stream and recycling essentially the remainder of the tail gas stream to the partial oxidation reactor, as recited in claim 11.

CA '391 teaches that the fusel oil stream of step (i) can be subjected to distillation in a fusel oil distillation zone to provide (i) an overhead stream comprising methanol, and (ii) a bottom purge fraction comprising heavy by-products and water, and for the overhead stream to be passed to the first methanol refining zone. In this case, the bottom purge fraction can be used as supplementary feedstock or fuel in the synthesis gas production plant (page 6, lines 19-23).

It would have been obvious to one having ordinary skill in the art at the time the

invention was made to have modified the process described by van Dijk with wherein the process further comprises the step of recycling a portion of the tail gas stream to the partial oxidation reactor; and wherein the process further comprises the step of withdrawing a purge stream from the tail gas stream and recycling essentially the remainder of the tail gas stream to the partial oxidation reactor because this would have provided a process for the production of methanol which enables significant additional methanol production to be achieved economically from an existing methanol synthesis plant, simultaneously with an increased feedstock to methanol conversion efficiency or yield, without requiring modification to existing process equipment items nor increasing the process duties of these items, by the utilization of by-product or waste streams from the existing plant as taught by CA '391 (page 3, lines 26-31; and page 6, lines 19-23).

d.       Wherein the tail gas stream contains nitrogen and the method further comprises separating at least a portion of the nitrogen from the waste gas stream to produce a nitrogen rich purge stream and a nitrogen reduced waste gas stream that is recycled to the partial oxidation reactor, as recited in claim 12.

e.       Wherein a membrane separator is used to separate the tail gas stream into the nitrogen reduced waste gas stream and the nitrogen rich purge stream, as recited in claim 13.

f.       Wherein the process further comprises combusting the nitrogen rich purge stream to produce energy, as recited in claim 14.

van Dijk teaches that the tail gas stream **50** contains nitrogen and the method further comprises separating at least a portion of the nitrogen from the waste gas stream to produce a nitrogen rich purge stream **56** (= the non-permeate portion of the tail gas stream) and a nitrogen reduced waste gas stream **54** (= a hydrogen rich permeate gas stream) [col. 8, line 61 to col. 9, line 4]. A membrane separator **52** (= a membrane diffusion unit) is used to separate the tail gas stream into the nitrogen reduced waste gas stream and the nitrogen rich purge stream (col. 8, lines 64-65; and col. 9, lines 5-20). The process further comprises combusting the nitrogen rich purge stream **56** to produce energy (= the non-permeate portion of the tail gas stream **56** is heat exchanged in heat exchanger **62** and fed by line **64** as fuel to the combustion unit **15** of the expander side **17** of the gas turbine **10**) [col. 9, lines 1-4].

The process of van Dijk differs from the instant invention because van Dijk does not disclose wherein the nitrogen reduced waste gas stream (= a hydrogen rich permeate gas stream **54**) that is recycled to the partial oxidation reactor.

CA '391 teaches that a hydrogen-enriched gas stream is recovered from hydrogen separation unit **138** in line **139** while a hydrogen-depleted gas stream is passed as off gas to line **140**. The off gas in line **140** can be fed to burners of the steam reformer furnace **5** by way of line **21**. Alternatively it can be combined with the natural gas feed in line **1** or with the carbon dioxide stream in line **11** (page 14, lines 11-15).

The process envisages the use of a combination of an additional methanol synthesis system, including a purge gas reactor, together with an additional system for

simultaneously recovery of methanol, carbon oxide-containing gases, and hydrogen, and recycle of at least one thereof to this additional methanol synthesis system (page 6, line 32 to page 7, line 23).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the process described by van Dijk by recycling the nitrogen reduced waste gas stream to the partial oxidation reactor because this would have enabled maximum additional methanol production achieved by the simultaneous recovery of methanol and carbon oxides and hydrogen, from the first methanol synthesis loop purge gas, and recovery of carbon oxides and hydrogen from one or more of the streams and inclusions of continuous recycle of synthesis gas through a purge converter, together with hydrogen recovery facilities to recover hydrogen from the unreacted gas allows maximization of the overall conversion efficiencies of carbon oxides and hydrogen to methanol as taught by CA '391 (page 6, line 32 to page 7, line 23).

g. Wherein additional carbon dioxide is provided by a carbon dioxide feed stream, as recited in claim 22.

CA '391 teaches that in operation sufficient CO<sub>2</sub> is preferably introduced through line **11** to provide a stoichiometric synthesis gas in line **25**; hence the rate of CO<sub>2</sub> addition is preferably controlled so that, on a molar basis, the hydrogen content is equal to twice the carbon monoxide content plus three times the carbon dioxide content (page

10, lines 18-21).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the process described by van Dijk by providing additional carbon dioxide by a carbon dioxide feed stream because this would have provided a stoichiometric synthesis gas as taught by CA '391 (page 10, lines 18-21).

II. Claims **2-3 and 16-18** are rejected under 35 U.S.C. 103(a) as being unpatentable over **van Dijk** (US Patent No. 5,472,986) in combination with **CA 2,210,391** ('391) as applied to claims 1, 8-14, 17, 20 and 22 above, and further in view of **CA 1,233,324** ('324).

van Dijk and CA '391 are as applied above and incorporated herein.

van Dijk teaches that the combustion of the purge stream **56** produces electricity (= the non-permeate portion of the tail gas stream **56** is heat exchanged in heat exchanger **62** and fed by line **64** to the combustion unit **15** of the expander side **17** of the gas turbine **10**) [col. 9, lines 1-4].

The process of van Dijk differs from the instant invention because van Dijk does not disclose the following:

a. Wherein the process further comprises electrolyzing water to produce hydrogen and oxygen and recovering at least some of the hydrogen to produce at least a portion of the hydrogen feedstock, as recited in claim 2.

b. Wherein the process further comprises the step of recovering at least a

portion of the oxygen from the water electrolysis to produce at least a portion of the oxygen feedstock, as recited in claim 3.

c. Wherein the electrolysis is conducted by running a fuel cell in reverse, as recited in claim 18.

d. Wherein the process further comprises electrolyzing water to produce hydrogen and oxygen and recovering at least some of the hydrogen to produce at least a portion of the hydrogen feedstock, as recited in claim 16.

Like van Dijk, CA '324 teaches a process for the production of methanol.

CA '324 teaches that that an even closer approximation of the desired stoichiometric ratio of  $H_2$  to CO in the composition of the synthesis gas to the methanol synthesis reactor can be achieved by associating the methanol reactor with a water electrolyzing plant which converts water into oxygen and hydrogen. Oxygen from the water electrolyzing plant is connected to the coal gasifier and a hydrogen line is connected to the gas line leading to the methanol synthesis reactor (page 6, line 21 to page 7, line 8).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the process described by van Dijk with wherein the process further comprises electrolyzing water to produce hydrogen and oxygen and recovering at least some of the hydrogen to produce at least a portion of the hydrogen feedstock; and wherein the process further comprises the step of recovering at least a portion of the oxygen from the water electrolysis to produce at least a portion of the

oxygen feedstock because the material yield of methanol can be improved considerably and at the same time, the air separation plant preceding the partial oxidation reactor would have been relieved of part of its load of separating air into oxygen and nitrogen as taught by CA '324 (page 6, line 21 to page 7, line 8).

As to wherein the electrolysis is conducted by running a fuel cell in reverse, the water electrolyzing plant would have been a fuel cell running in reverse.

e.      Wherein the partial oxidation reactor produces waste heat and the waste heat is used to generate electricity, as recited in claim 17.

CA '324 teaches that the raw gas from the gasifier is a mixture of constituents including CO<sub>2</sub>, CO, H<sub>2</sub>, H<sub>2</sub>S and dust. The heat generates steam which is fed as live steam to the steam power generating plating part (page 9, lines 15-23; and page 14, lines 1-6).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the partial oxidation reactor described by van Dijk with wherein the partial oxidation reactor produces waste heat and the waste heat is used to generate electricity because the heat would have generated steam which would have been fed as live steam to the steam power generating plating part as taught by CA '324 (page 9, lines 15-23; and page 14, lines 1-6).

III.      Claims 4-7 are rejected under 35 U.S.C. 103(a) as being unpatentable over van

**Dijk** (US Patent No. 5,472,986) in combination with **CA 2,210,391** ('391) as applied to claims 1, 8-14, 17, 20 and 22 above, and further in view of **Vernon et al.** ("Partial Oxidation of Methane to Synthesis Gas", *Catalysis Letters*, Vol. 6 (1990), pp. 181-186).

van Dijk and CA '391 are as applied above and incorporated herein.

The process of van Dijk differs from the instant invention because van Dijk does not disclose the following:

- a.     Wherein the process further comprises the step of adjusting the amount of the oxygen feedstock to the amount of the hydrocarbon feedstock fed to the partial oxidation reactor such that the partial oxidation reactor effluent contains some unoxidized hydrocarbon feedstock, as recited in claim 4.
- b.     Wherein the partial oxidation reactor effluent contains less than about 10 wt% unoxidized hydrocarbon feedstock based on the weight of the partial oxidation reactor effluent, as recited in claim 5.
- c.     Wherein the synthesis gas contains less than about 4 wt% unoxidized hydrocarbon feedstock based on the weight of the partial oxidation reactor effluent, as recited in claim 6.
- d.     Wherein the process further comprises the step of adjusting the amount of the oxygen feedstock to the amount of the hydrocarbon feedstock fed to the partial oxidation reactor such that the partial oxidation reactor effluent is essentially free of oxygen, as recited in claim 7.

Like van Dijk, Vernon teaches the partial oxidation of methane to synthesis gas.



Vernon teaches that the influence of the  $\text{CH}_4/\text{O}_2$  ratio of the feedstock on the partial oxidation reaction (table 2) is also consistent with the achievement of chemical equilibrium according to eqs. (3)-(6). Lean mixtures give enhanced methane conversions with a higher proportion of combustion products whereas rich mixtures give better selectivity to synthesis gas with poorer methane conversions. The 2:1 stoichiometric ratio appears to give the optimum yields (pages 183-184, "3. Results and discussion").

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the process described by van Dijk with wherein the process further comprises the step of adjusting the amount of the oxygen feedstock to the amount of the hydrocarbon feedstock fed to the partial oxidation reactor such that the partial oxidation reactor effluent contains some unoxidized hydrocarbon feedstock; wherein the partial oxidation reactor effluent contains less than about 10 wt% unoxidized hydrocarbon feedstock based on the weight of the partial oxidation reactor effluent; wherein the synthesis gas contains less than about 4 wt% unoxidized hydrocarbon feedstock based on the weight of the partial oxidation reactor effluent; and wherein the process further comprises the step of adjusting the amount of the oxygen feedstock to the amount of the hydrocarbon feedstock fed to the partial oxidation reactor such that the partial oxidation reactor effluent is essentially free of oxygen because the influence of the  $\text{CH}_4/\text{O}_2$  ratio of the feedstock on the partial oxidation reaction was consistent with the achievement of chemical equilibrium. Lean mixtures gave enhanced

methane conversions with a higher proportion of combustion products whereas rich mixtures gave better selectivity to synthesis gas with poorer methane conversions. The 2:1 stoichiometric ratio appeared to give the optimum yields as taught by Vernon (pages 183-184, "3. Results and discussion").

**IV.** Claim **15** is rejected under 35 U.S.C. 103(a) as being unpatentable over **van Dijk** (US Patent No. 5,472,986) in combination with **CA 2,210,391** ('391) as applied to claims 1, 8-14, 17, 20 and 22 above, and further in view of **Henningsen** (US Patent No. 6,005,011).

van Dijk and CA '391 are as applied above and incorporated herein.

The process of van Dijk differs from the instant invention because van Dijk does not disclose wherein the combustion of the purge stream produces heat that is used to preheat at least one of the feedstocks of the partial oxidation reactor, as recited in claim 15.

Like van Dijk, Henningsen teaches a process for the production of methanol.

Henningsen teaches supplying a purge stream from the loop stream from step (f) for combustion in a gas turbo generator to provide electricity for supplying the oxygen to step (c) and for preheating the associated gas for the partial oxidation in step (c) [col. 2, lines 5-8].

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the process described by van Dijk with wherein

the combustion of the purge stream produces heat that is used to preheat at least one of the feedstocks of the partial oxidation reactor because the partial oxidation reaction would have auto-initiated due to the preheated nature of a refractory lined partial oxidation reactor. This would have greatly simplified startup as taught by Henningsen (col. 2, lines 5-8; and col. 4, lines 8-23).

Furthermore, CA '391 teaches the entering gas is preheated to reaction temperature by upward passage through tubes mounted in the hot catalyst bed. The heat of reaction is used to preheat the incoming feed gas which moderates catalyst temperature (page 11, lines 27-29).

**V.** Claims **19, 21 and 23-25** are rejected under 35 U.S.C. 103(a) as being unpatentable over **van Dijk** (US Patent No. 5,472,986) in combination with **CA 2,210,391** ('391) as applied to claims 1, 8-14, 17, 20 and 22 above, and further in view of **Steinberg et al.** (US Patent No. 5,344,848).

van Dijk and CA '391 are as applied above and incorporated herein.

The process of van Dijk differs from the instant invention because van Dijk does not disclose the following:

a. Wherein at least a portion of at least one of the hydrocarbon feedstock and the hydrogen feedstock is obtained from biogas, as recited in claim 19.

van Dijk teaches natural gas (col. 1, lines 10-11).

Like van Dijk, Steinberg teaches a process for the production of methanol.

Steinberg teaches using condensed carbonaceous raw materials such as coal, natural gas (i.e., methane), wood, municipal solid waste, other biomass and other carbonaceous material for such production (col. 1, lines 9-15; and col. 3, lines 39-46). There are several commercially viable methods for producing methanol. While different feedstocks are used and various processing steps are involved in these methods, they all must produced or otherwise provide carbon monoxide and hydrogen in a molar ratio of 1 mole CO to 2 moles of H<sub>2</sub> (col. 1, lines 27-35).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the at least one of the hydrocarbon feedstock and the hydrogen feedstock described by van Dijk with wherein at least a portion of at least one of the hydrocarbon feedstock and the hydrogen feedstock is obtained from biogas because biogas (from biomass) would have provided carbon monoxide and hydrogen in a molar ratio of 1 mole CO to 2 moles of H<sub>2</sub> as reactants to be a commercially viable method for producing methanol as taught by Steinberg (col. 1, lines 9-15 and 27-35; and col. 3, lines 39-46).

b.     Wherein additional carbon dioxide is provided by a carbon dioxide feed stream and at least a portion of the carbon dioxide stream is obtained from biogas, as recited in claim 21.

c.     Wherein the hydrocarbon feedstock is obtained from biogas and includes carbon dioxide, as recited in claim 23.

CA '391 teaches that in operation sufficient CO<sub>2</sub> is preferably introduced through line **11** to provide a stoichiometric synthesis gas in line **25**; hence the rate of CO<sub>2</sub> addition is preferably controlled so that, on a molar basis, the hydrogen content is equal to twice the carbon monoxide content plus three times the carbon dioxide content (page 10, lines 18-21).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the process described by van Dijk by providing additional carbon dioxide by a carbon dioxide feed stream because this would have provided a stoichiometric synthesis gas as taught by CA '391 (page 10, lines 18-21).

As to at least a portion of the carbon dioxide stream is obtained from biogas, Steinberg teaches that the processes known in the art often also produce carbon dioxide (col. 1, lines 39-40).

d.      Wherein the carbon dioxide feed stream is provided upstream from the partial oxidation reactor, as recited in claim 24

CA '391 teaches that the carbon dioxide feed stream **11** is provided upstream from the reformer tubes **20** (Fig. 1).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the process described by van Dijk by providing the carbon dioxide feed stream upstream from the partial oxidation reactor because this would have been functionally equivalent to providing the carbon dioxide feed stream

from the reformer tubes as disclosed by CA '391 (Fig. 1).

e. Wherein the carbon dioxide feed stream is provided downstream from the partial oxidation reactor, as recited in claim 25.

CA '391 teaches that the carbon dioxide feed stream **11** is provided upstream from the reformer tubes **20** (Fig. 1).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the process described by van Dijk by providing the carbon dioxide feed stream downstream from the partial oxidation reactor because the selection of any order of performing process steps is prima facie obvious in the absence of new or unexpected results. See *In re Burhans*, 154 F.2d 690, 69 USPQ 330 (CCPA 1946).

**VI.** Claim **26** is rejected under 35 U.S.C. 103(a) as being unpatentable over **van Dijk** (US Patent No. 5,472,986) in combination with **CA 2,210,391** ('391) as applied to claims 1, 8-14, 17, 20 and 22 above; and further in view of **Steinberg et al.** (US Patent No. 5,344,848) as applied to claims 19, 21 and 23-25 above, and further in view of **Smis et al.** (US Patent No. 5,389,258).

van Dijk, CA '391 and Steinberg are as applied above and incorporated herein.

The process of van Dijk differs from the instant invention because van Dijk does not disclose wherein the biogas is obtained from anaerobic decomposition of biomatter, as recited in claim 26.

Like Steinberg, Smis teaches the decomposition of organic waste. Smis teaches that biogas is obtained (= for the extraction of biogas) from anaerobic decomposition of biomatter (= anaerobic decomposition of degradable organic waste) [col. 1, lines 8-14].

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the biomass described by Steinberg with wherein the biogas is obtained from anaerobic decomposition of biomatter because biogas was obtained from anaerobic decomposition of biomatter as taught by Smis (col. 1, lines 8-14).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Edna Wong whose telephone number is (571) 272-1349. The examiner can normally be reached on Mon-Fri 7:30 am to 4:00 pm.

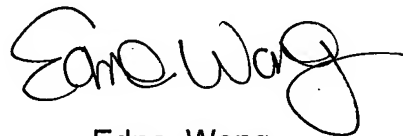
If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam Nguyen can be reached on (571) 272-1342. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

A handwritten signature in black ink, appearing to read "Edna Wong", with a stylized, cursive script.

Edna Wong  
Primary Examiner  
Art Unit 1795

EW  
December 17, 2007